Cornell University
Cornell Cooperative Extension
Eastern New York Commercial Horticulture

Vegetable News

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Fall Clean-Up in the Greenhouse and Tomato Stakes

Charles Bornt—ENYCHP

Although there is still a ton of work to do with fall crop harvesting, cover cropping etc., there are a couple things that you can do now to get ready for next spring! Cleaning and sanitizing greenhouses now could help reduce disease and insect issues next spring.

First, make sure that any weeds that have either grown up in the greenhouse or have encroached from the outside are not only pulled, but completely removed from the greenhouse. These weeds can serve as hosts for diseases and insects for next spring's crop.

Disinfection: There are several disinfectants that can be used for disinfecting greenhouse benches and tomato stakes and each one has pro's and con's. But first things first: **The cleaner you start, the better job your disinfectant will do!** Start by:

* Physically cleaning all dirt and debris from the surfaces you want to disinfect! This includes greenhouse benches, inserts, bottom trays, tomato stakes and even landscape fabric if you have it on the floors etc.
* "Pre-cleaning" is important because organic matter, dirt and other particulates tie up the active ingredients in our disinfects and reduce their effectiveness!
* There are lots of ways to do this but I think the most effective is to use a power washer or a hose and scrub brush. Yes, it is time consuming, but well worth it otherwise the rest of the sanitation could be worthless!
* In the case of tomato stakes, do not pack stakes too tightly in washing con-

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tainer—allow solution to distribute evenly and contact all surfaces of the stake. Surfaces of stakes in the middle of a tightly packed group may not completely be soaked.

Clorox/Bleach (5.25% sodium hypochlorite)

- Use rate of 1 part bleach to 9 parts of water (or 10% solution).
- Completely submerge stakes and allow to soak for at least 30 minutes before removing and rinsing.
- If possible, lower water pH to 6.5 – 5.8 to obtain the most activity from bleach.
- Add bleach or change water frequently when it becomes visibly dirty.
- Bleach is also short-lived after mixing in water, with a half-life of only 2 hours so replenishing often will be critical for the best activity.

Green-Shield (quaternary ammonium chloride salt)

- Recommended use rate is 1 tablespoon (= 0.5 fl oz) per gallon of clean water.
- Allow surfaces to remain wet for 10 minutes before rinsing off with clean water.
- For stakes, trays and inserts, use the same rate as above and fully submerge and allow to soak for 10 minutes and rinse thoroughly.
- Very effective and economical: 1 gallon of Green-Shield is equal to 28 gallons of Clorox.

ZeroTol 2.0 (hydrogen peroxide + ethaneperoxoic acid)

- Use a dilution of 1:300 or ½ fl. oz per gallon of clean water and spray until runoff on greenhouse surfaces etc.
- Use a dilution of 1:50 or 2½ fl. oz. of ZeroTol 2.0 per gallon of clean water **if surfaces have not been pre-cleaned.**
- For stakes, trays and inserts, use a 1:100 – 1:300 or 1¼ fl. oz. – ½ fl. oz. per gallon of clean water and spray until runoff (according to label). However, I would recommend submerging these items for at least 5 minutes before rinsing with clean water.

Sanidate 5.0 (hydrogen peroxide + peroxyacetic acid)-OMRI approved

-Use a dilution rate of 1:256 or 0.5 fl. oz. per gallon of water for all non-porous surfaces that have been pre-cleaned with water.

Preparing for the Fall Flight of Allium Leafminer

Ethan Grundberg, ENYCHP

The new invasive fly pest, allium leafminer (ALM), was found throughout much of the lower Hudson Valley this spring. Adult feeding and egg-laying damage was confirmed in Sullivan, Orange, Dutchess, Ulster, and Southern Columbia counties beginning April 20th and ending around the last week of May. Larvae that hatch from those eggs eat their way down the inside of the leaves toward the bulbs opening up physical wounds where soft rot pathogens often enter. The larvae then pupate either inside the bulb and stem or in the soil around the plants for the entire summer. Though we do not have predictive models to help us determine the likely date of emergence of the fall brood, ALM adults emerged from pupae near the end of September in Pennsylvania in 2016 and were active for 4-6 weeks. We are scouting fields on farms with known ALM populations already in an effort to detect emergence as early as possible. Entomologists from Penn State University believe that fall emergence may be a week to ten days earlier than 2016, so growers with fall alliums should be prepared for ALM activity by the week of September 18th and watch for alerts from our team once we confirm the beginning of the fall flight.

Since there are typically fewer cultivated and wild alliums in the environment in the fall, growers in Pennsylvania have experienced a "concentration effect" with their fall grown alliums. The spring population is spread across a wider and larger host population, but since the fall ALM flight has fewer host plants (leeks, chives, and scallions), the damage to those crops is more severe. Most affected alliums this spring had no more than two larvae or pupae per plant when inspected. In contrast, growers with infestations in fall leeks in Ulster county in 2016 encountered well over 100 pupae per plant.

The most effective strategy for limiting damage from ALM this fall is to use row cover beginning next week on all alliums that still have lush green growth in the field (storage onions that are still field curing are not at risk) to prevent adults from landing on host crops. We are working with Dr. Brian Nault to conduct an insecticide efficacy field trial that includes both conventional and OMRI-approved products this fall, but do not currently have any pesticide efficacy data to share. There will be a free twilight meeting in Orange County on Thursday, October 19th to share preliminary findings from that study;

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click here https://enych.cce.cornell.edu/event.php?id=828 for more information and to register for the event.

Growers who have been spraying leeks all summer for onion thrips need to make sure that they have not already reached the maximum annual application rate of products like Agri-Mek (abamectin, IRAC Group 6), Radiant (spinetoram, IRAC Group 5), and Exirel (cyantraniliprole, IRAC Group 28) that are also labeled for leafminer management in allium crops. There is some anecdotal evidence from the spring flight that Trigard (cyromazine, IRAC Group 17) was effective at managing ALM at the labeled rate of 2.66 oz/acre in at least 10 gallons of water. Please note, however, that there is a 7-day PHI for Trigard and Agri-Mek on bulb vegetables (including leeks, chives, and green onions), whereas Exirel and Radiant have a 1-Day PHI. Organic growers unable to use row cover are encouraged to use Entrust (spinosad, IRAC Group 5) at the 2 oz/acre rate along mixed with a 1%-1.5% v/v solution of M-Pede (potassium salts of fatty acids) for better penetration of the waxy cuticle once adult feeding has begun. As always, you must follow the instructions in the label for all pesticides!



We suspect that the geographic distribution of ALM will continue to spread this fall, so growers in the Capital District should be on the lookout for signs of activity in addition to farms in the Hudson Valley. We are recommending that growers thoroughly inspect allium leaves for the linear adult oviposition marks of at least 10 plants on each field edge on a weekly basis until activity is observed. If you have any questions about what you are seeing in your fall alliums, please contact one of the vegetable specialists on the ENYCHP team for diagnostic support.

Left: *Adult ALM oviposition marks on onion leaf Photo: E. Grundberg*

Middle: *ALM pupae in Ulster Co. leek from fall 2016. Note the soft rot in the larval mines. Photo: T. Rusinek*

Right: *ALM larval mining on scallions. Adult oviposition marks also visible on middle leaf Photo: T. Rusinek*

Lettuce and Spinach Downy Mildew

Amy Ivy, ENYCHP

Downy mildews in general are complicated diseases. They are specific to certain plants so the downy mildew that wipes out basil (*Peronospora belbahrii*) is not the same that wipes out your cucumbers (*Pseudoperonospora cubensis*) or onions (*Peronospora destructor*), and the one that affects lettuce (*Bremia lactucae)* is different from the one that hits spinach (*Peronospora farinosa f.sp. spinaciae*). They do not overwinter outdoors here, except on host crops grown in heated greenhouses, so each year we wait for spores to arrive, mostly blown in on air currents.


Photos of DM lesions. Left: On surface of leaf. Right: white sporulation on underside of same leaf

Lettuce downy mildew is not uncommon this time of year since it does best under cool, damp conditions typical of fall weather. It makes characteristic angular yellow patches

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on the leaf surface with white, fuzzy growth on the underside. It starts with the older leaves but quickly moves up through the plant. The best management option is to choose disease resistant varieties but with 32 races of lettuce downy mildew, it can be hard to find varieties resistant to all of them. Planting lettuce in individual rows by variety rather than mixing them together will help you identify susceptible varieties and allow you to harvest from only the resistant rows and turn under the affected rows. For more information visit: http://ipm.ucanr.edu/PMG/r441100411.html


Spinach downy mildew causes less angular yellow patches on the surface and purplish fuzzy sporulation on the undersides of those patches

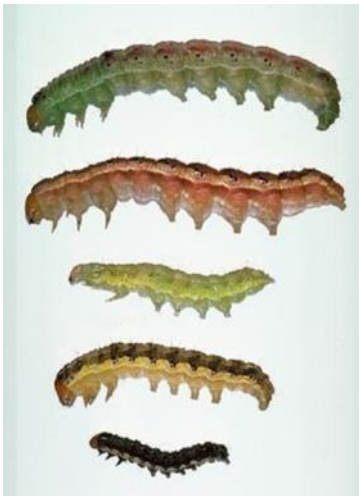
We began to see spinach downy mildew in some high tunnels around the state last winter and we remain interested in knowing where it is showing up. Please contact any of us if you suspect you have spinach downy mildew. For more information visit: http://blogs.cornell.edu/livegpath/2016/11/15/disease-alert-spinach-downy-mildew/

Late Season Lepidopteran Pests in Tomato and Pepper

Teresa Rusinek, ENYCHP

European corn borer and Corn Ear Worm (CEW) are not pests we typically associate with solanaceous crops. But late in the season when corn is drying down and less attractive to egg-laying moths, these pests may move into your peppers and tomatoes. Corn ear worms actually have a wide host range; however, corn and tomato are preferred hosts. When we find CEW in tomato we call it fruitworm and it's called bollworm in cotton. Small fruitworm larvae often enter tomato fruit at the calyx end, they will burrow deep into the fruit and cause a wet rot. Larva are variable in color, making identification tricky sometimes. CEW migrate from the south and do not overwinter in our region. European corn borer (ECB) is often found in peppers especially sweet bell pepper types. ECB typically enter the pepper at the calyx after hatching and after feeding and growing exit through the side wall. Immature fruits that are infested will likely rot and drop off. Those infested closer to maturity may appear healthy and or redden prematurely. ECB do overwinter in our region in crop or weed debris. Armyworms are another late summer "worm" that may move into tomatoes. They feed on both foliage and the surface of fruit. Management must






Top Left: *ECB Larvae tunneling in Pepper. Photo – Virginia Cooperative Extension, Pub. 444-006* ***Bottom Left:*** *Yellow striped armyworm surface feeding damage on tomato. Photo courtesy of University of Delaware Cooperative Extension* ***Top Right:*** *CEW larvae are variable in color, ranging from pale yellow, to red, to green, to brown with pale stripes running lengthwise. Photo-University of California* ***Bottom Right:*** *Tomato Fruit worm in Tomato, University of Kentucky ENTFACT-313*

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take place early when larvae are small; once larvae become large they are difficult to control. Keep an eye on our corn lep pest counts in our weekly newsletters to get a sense if moths are flying in your area. Pay extra attention to scouting when neighboring corn fields are drying down.

Pre-Planting Garlic Considerations

Crystal Stewart, ENYCHP

This year there is quite a lot of disease showing up in garlic in storage. This is going to add some extra work for affected growers at planting, but fortunately that extra work should pay off by largely taking care of the problem for next year's crop (weather depending, of course). Here are some things to consider once you get cracking:

Taking the time to identify any problems is always a good idea

Do you have botrytis neck rot? Mites? Fusarium? Rather than simply tossing soft garlic into the garbage, take the time to open up a bulb now and then and examine the symptoms. Botrytis enters the bulb through the neck, and rots the bulbs from the center outward. Fusarium may attack the basal plate or may cause lesions on the bulb itself. Fusarium is present on almost all garlic at low levels, but can be increased by poor growing conditions (excessive water, poor fertility or poor soil biology), poor post-harvest handling (bruising), and poor storage conditions (too warm and moist can increase disease dramatically). I have included an entire article on mites, which can explode under even ideal storage conditions, but thrive in warm, dry environments.

Depending on the disease, management in the future may vary. If you are dealing with Botrytis, culling seed stock hard to eliminate infested bulbs is the most important step. A surface sterilizer at planting such as Oxidate or Sanitate as a dip can kill any spores which were present in storage and might infest garlic in the coming year. If dealing with Fusarium, try to cull any garlic with symptoms you can feel, but more importantly create an optimal growing environment. Garlic that is in wet fields will benefit from raised beds, and we have found that both plastic and straw mulches can improve the garlic crop (look for research results on this study in an upcoming Produce Pages). Dips will not help with Fusarium because this disease is systemic.

Create an ideal growing environment now for better garlic next year

We are about a month ahead of planting now, and this is a great time to assess your future garlic location and make any needed changes. How is the **drainage** in this field? Are you going to need to make raised beds? If planting on plastic, you might want to consider making raised beds well ahead of time in order to ensure that you can finish this task when soil moisture is optimal. Every year I watch growers struggle with bed formation as the fall gets wetter and wetter. This is a slightly riskier proposition for bare raised beds that will remain so or will be straw mulched, but it might end up being worth considering.

Consider the **weed complex** in the area you are planting into. Did you control perennial weeds (I'm looking at you, quackgrass)? Do you know what annual weeds are going to pose the biggest problem, and do you have a plan for control? Winter annuals plague some growers; for others crabgrass or lambsquarter are the main issue. Know when you will need to have strategies in place, and do anything you can at planting.

Fertility may be applied entirely in the fall if using organic, slow-release amendments; growers using mobile sources of N should only apply P and K at planting. Optimize P and K using a soil test, and aim for 50-100 lbs of available N early in the spring for the garlic. Nitrogen is tricky in garlic because soil temperatures dramatically affect availability. Many growers are tempted to put much more than 100 lbs/A down to overcome this issue. It's an understandable strategy, but chances are very good that much of this N is wasted. We are still researching this question, and will have more answers in the coming year. Or maybe we will just have more questions. Either way, we will share!

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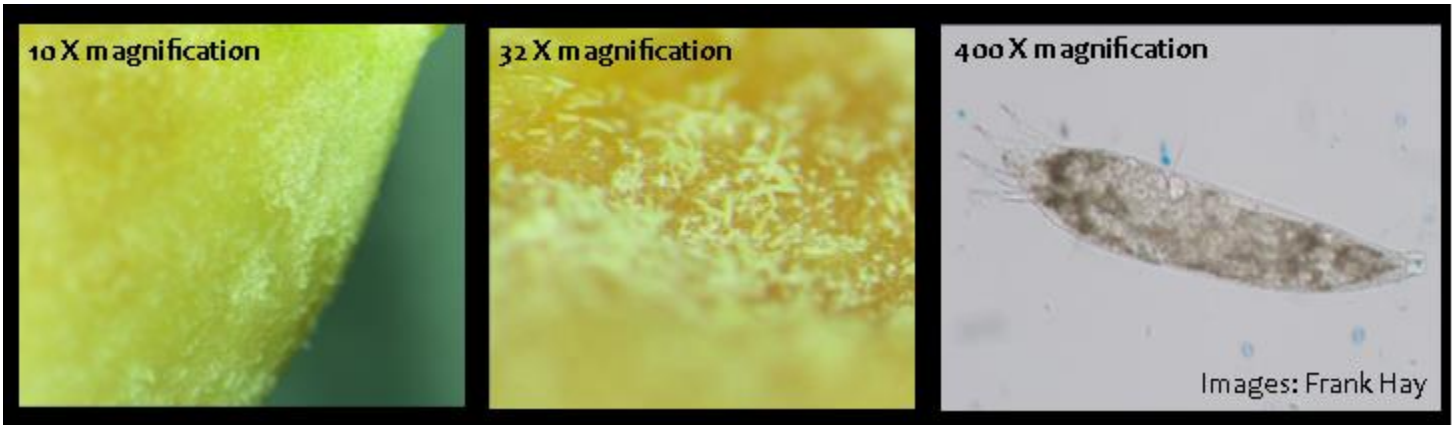
Eriophyid Mites: Micro-Scourge of Garlic

Crystal Stewart, ENYCHP

We received many calls from growers last winter remarking that their garlic just wasn't holding up the way it should. Cloves were drying out and discoloring much earlier than would be expected. Dr. Frank Hay at the Geneva Experiment station popped some of this suspect garlic under a microscope and found some very unwelcomed visitors: Eriophyid mites. These mites are small. I mean really small. Hugely small! Invisible to the naked eye, and unrecognizable under a hand lens. Only at 32x magnification do we start to see them clearly, but honestly you might not want to. I will show you anyway:

Peeled suspicious cloves. Image: Frank Hay



Yikes! This was not what I was expecting to see on the surface of those desiccated cloves. Yet as I started digging with the help of our dedicated entomologists, it became clear that this is an issue we as an industry have been dealing with for a while. We may not have been seeing the mites, but we have been seeing their symptoms, and writing them off as poorly cured garlic in storage and as environmental stress/viruses in the field.

Examination of the symptoms:

Garlic can degrade in storage for a variety of reasons. Poor post-harvest handling, sub-optimal storage conditions (too warm, too wet, etc), and high disease pressure can all play roles in garlic storing poorly. To determine which of these issues affects your garlic, peel 10-15 cloves and examine them closely. One way to differentiate mite damage from other issues, particularly if you are having issues shortly after garlic enters storage, is to look for a dull surface to cloves as opposed to a shiny surface. The mites rasp at the surface of the clove, and are themselves dusty looking on the surface. From here, find the highest magnification hand lens you can to look at the surface, and look for what look like very, very small thrips. Or you can send samples to the diagnostic clinic to have the presence or absence of mites verified.

In the field, mite damage can be seen early in the growing season as stunted, twisted growth with streaking (Lange and Mann, 1960). Notably, the plants tend to out-grow this damage. The first few leaves may emerge stunted and twisted, but later growth may appear fine.

Control Measures:

There are two methods of control of Eriophyid mites which show promise. The first, which comes from Oregon State (Jepson and Putnam, 2008), is to soak seed stock for 24 hours immediately prior to planting in a 2% soap and 2% mineral oil water bath. I'd recommend this as a control if you detect an issue prior to planting, but after drying the garlic.

A second control measure is heating the garlic to between 113° and 119° F briefly during the drying process. At 113° mite eggs are killed within an hour (Courtin et al, 2000). This process should be done with great attention to prevent bulbs reaching the

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temperature of 120°, at which point waxy breakdown occurs. Bringing garlic to this temperature while monitoring the crop, then dropping back to between 100° and 110° for the remainder of drying should yield good control and maintain crop quality. Check for mites before putting the garlic into storage, to determine storage protocol.

If mites are detected in garlic which is being kept for consumption rather than planting, the best method to stop population increase is to store the garlic cold. Maximum population growth occurs at 77° and 80-95% RH (note, this temperature would be considered fine for most other storage considerations, so if you have a mite issue, storage as usual will not work). As the temperature drops from here, reproduction slows, stopping at 43°. Hence, a moderate infestation could be held static by storing garlic at 43° or lower. If you store cool to cold, remember that the garlic is being vernalized, and will sprout if brought to warmer temperatures. Keep it cold until its being sold or distributed.

Additional best practices can help to reduce mite pressure over time. Mites may reside in the soil, so make sure to practice crop rotation(as a general rule a 3 year rotation is good; 4 is better). Periods of field saturation can greatly reduce mite numbers, so the wet fall and winters we have been having could actually play in our favor.

This pest will be receiving additional attention over the coming years, with more control recommendations being evaluated, including rotations and chemical controls (organic and conventional), as well as biocontrols. When considering chemical controls, remember this is a mite, not an insect, and that acaricides, not insecticides, will be most effective. That said, at this point there do not appear to be any acaricides labeled for eriophyid mite control in garlic in New York that this time.

What is an eriophyid mite, anyway?

It turns out that if you are confused by mites, you aren't alone. Some garlic growers have heard of wheat curl mite in the past (*A. tosichella)* and now we are adding in dry bulb mite (*A. tulipae*) as another worry. The two have been confused by entomologists for years, and the differences are still being teased out (Skoraka et al, 2013) . Notably, there is still work needed to understand which mites will feed on garlic and other alliums, and to what extent.

One key difference to be aware of, however, is that eriophyid mites are different from bulb mites. Bulb mites feed primarily on damaged or decaying tissue, while eriophyid mites will feed on healthy tissue. Bulb mites are slightly larger, pearly cream colored, and bulbous.

References:

Courtin, 0., Fauvel, G. and Leclant, F. Temperature and relative humidity effects on egg and nymphal development of *Aceria tulipae* on garlic leaves. Ann. Of Appl. Biology, 137: 207-211. 2000

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Skoracka, A., Lechoslaw, K., Rector, B., Amrine, J. Wheat curl mite and dry bulb mite: untangling the taxonomic conundrum through a multidisciplinary approach. Biological Journal of the Linnean Society. 111: 421-436. 2014.

Connect with the Eastern NY Commercial Horticulture Team on Facebook for information on our events, research , and agricultural updates!

https://www.facebook.com/CCEENYCHP/

Produce Needed for Hurricane Relief!!

Maire Ulrich, ENYCHP

NYS Fruit & Vegetables growers are getting together some loads of "hard" crops (apples, onions, cabbage, winter squash and anything else you think will last a week at room temperature) to send down to TX and, likely, Florida. Feeding America is handling transportation. You will all receive a record of donation.

Dates are weekly to help donations be delivered to where they can be most efficiently used over the next month while emergency feeding continues.

What you can do…. Contact me (Maire 845-742-4342/e-mail mru2@cornell.edu or at the office 845-344-1234)and tell me:

how many pallets of
what product you can donate to
which location and
when you think you'll deliver.

Each week, I'll need to know this info by 12:00 noon the day before – Wednesday.

I will need name/address/contact info of donor for records too but that is not quite as urgent as the above.

The schedule is shaping up like this:

⇒ Weekly, beginning Thursday, 9/14 - **Lower Hudson (Orange/Ulster)** – Modern Produce, 77 Skinners Lane, Goshen NY 10924. Time TBD.

(If I have enough interest from Ulster there may be a 2nd truck out of Ulster (any volunteers to be the location?) on 9/21.)

⇒ Weekly, beginning Thursday, 9/21 – **Albany area** – working on location. ***If you want to be location or have product please call ASAP!***

⇒ Weekly, beginning Thursday 9/28 – **Finger Lakes** – Hansen Farms, 2330 Mott Rd., Stanley, NY 14561

⇒ Thursday 10/5 – **Western NY** – Torrey Farms, 4319 Maltby Rd., Elba, NY 14058 go west on Mechanic Street off of Rte 98.

⇒ Potential for a location in Broome County for 10/12.

All locations are able to hold product for a day or 2 before pick-up. Once you've committed to a location, I'll get you more about exact pick-up time if you plan on drop-off for that day.

Controlled Environment Agriculture (CEA) Conference Upcoming

Have you been researching new ways to grow vegetables? Is your farm looking to diversify? Controlled Environment Agriculture (CEA) may be the answer----and this conference can help!

CEA enables year-round production of fresh vegetables through greenhouse environmental control (heating, lighting) combined with hydroponic/soilless production systems. While CEA is an increasingly popular method of meeting consumer demand for locally grown food, many factors must be considered when developing a business plan and assessing its viability. This conference is intended to provide more detailed knowledge of CEA production systems, economics, marketing, and ways to access financing and state resources. It will also help guide new or transitioning operations through the process of developing a business plan for a CEA greenhouse vegetable business. More information and the agenda is available at: http://www.cornellcea.com/workshops/index.html

The conference will be held November 1st and 2nd in Ithaca NY. The group size will be limited to 30 businesses (each may send 1 or 2 representatives), and attendees must apply to be accepted into the program.

The program will combine practical information specific to CEA businesses including costs of production, financing sources and state and regional incentives, marketing, along with a structured process for developing an agriculture business plan. The Minnesota Institute for Sustainable Agriculture as well as the NYS Small Business Development Center templates will be used. Sample worksheets will lend a practical perspective and illustrate how to set goals, research processing alternatives, determine potential markets, and evaluate financing options. Templates will help participants to develop a detailed, lender-ready business plan or map out strategies to take advantage of new opportunities.

Who should apply to attend? Anyone with a serious interest in developing a business plan for a New York state based commercial CEA operation. Attendees may represent a completely new business in early stages of development or an existing agriculture operation looking to transition to greenhouse CEA. Attendees must agree to complete homework assignments guiding them through stages of the business planning process prior to the conference. Attendees must also agree to complete a draft business plan and to complete a brief annual survey on business development and economic impact related to their CEA business.

If selected, the program is free, however travel and lodging must be covered by attendees. Applications are due by September 29 and must be completed online here. If selected to attend you will be notified by October 3.

The program is hosted by Cornell University and will be led by Neil Mattson, associate professor and director of the Cornell CEA group; Laura Biasillo, Agricultural Economic Development Specialist; Miguel Gómez, associate professor and horticultural economist; and Julie Stafford, Industry Liaison, Cornell Institute for Food Systems. For questions please contact Neil Mattson at nsm47@cornell.edu

Attendees may also wish to attend the November 3 meeting of the Cornell CEA Advisory Board, a large multi-faceted stakeholder group which meets twice yearly to address opportunities and barriers in the CEA supply chain. Summaries from previous meetings are available at: http://www.cornellcea.com/about/people/advisory-board.html

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CIFS CORNELL INSTITUTE FOR FOOD SYSTEMS

NY farm viability INSTITUTE

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FYI

Tractor Rollovers are the worst fear of any farming family. These tragedies can strike any fam operation in an instant. This harvest season, we hope that you will each take a moment to consider your own equipment. Are you operating an open tractor without a rollbar?

The good news is that there is financial assistance available if your farm is in need of a rollbar! The National ROPS Rebate program will cover 70% of the cost and installation for farms in NY State! Please find more information at https://www.ropsr4u.com/national-rebate-program.php

- 80% of deaths caused by rollovers happen to experienced farmers
- 7 out of 10 farms will go out of business within five years of a tractor overturn fatality
- Roughly ½ of US tractors do not have rollover protection
- Through the National ROPS Rebate Program, the average out-of-pocket expense for a ROPS kit is $391.
- ROPS are 99% effective in preventing injury or death in the event of an overturn when used with a seatbelt, and 70% effective when used without a seatbelt.

RAISE THE BAR
NATIONAL ROPS REBATE PROGRAM
NATIONAL TRACTOR SAFETY COALITION

Sweet Corn Pheromone Trapping Network 9/6 - 9/12

County	CEW	ECB-Z	ECB-E	FAW	WBC
Orange	2	0	0	19	1
S. Ulster	0	0	0	0	0
N. Ulster	0	0	1	0	0
N. Dutchess	na	na	na	na	na
Columbia	7	0	0	26	0
Greene	1	0	0	16	0
Albany	10	3	0	0	0
Schoharie	3	0	0	4	0
Fulton	na	na	na	na	na
Saratoga	0	0	0	2	0
S. Washington	1	0	0	5	0
N. Rensselaer	na	na	na	0	na
S. Clinton	0	0	0	0	1
C. Clinton	0	0	0	4	3

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